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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO.   |
|---|-------------|----------------------|---------------------|--------------------|
| 09/909,858  | 07/23/2001  | Sung-jin Kim         | 249/271             | 8771               |
| 7590  | 01/05/2005  |                      | EXAMINER            |                    |
| The Law Offices of Eugene M Lee, PLLC<br>Suite 1200<br>2111 Wilson Boulevard<br>Arlington, VA 22201 |             |                      |                     | PATHAK, SUDHANSU C |
|   |             | ART UNIT             |                     | PAPER NUMBER       |
|   |             | 2634                 |                     |                    |

DATE MAILED: 01/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                     |              |
|------------------------------|---------------------|--------------|
| <b>Office Action Summary</b> | Application No.     | Applicant(s) |
|                              | 09/909,858          | KIM ET AL.   |
|                              | Examiner            | Art Unit     |
|                              | Sudhanshu C. Pathak | 2634         |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on July 23<sup>rd</sup>, 2001.  
 2a) This action is FINAL.                            2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-15 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-7,9,11,12-15 is/are rejected.  
 7) Claim(s) 8 and 10 is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on July 23<sup>rd</sup>, 2001 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date 2.

4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_.  
 5) Notice of Informal Patent Application (PTO-152)  
 6) Other: \_\_\_\_\_.

**DETAILED ACTION**

1. Claims 1-to-15 are pending in the application.

***Specification***

2. The disclosure is objected to because of the following informalities:

- The disclosure contains a duplicate copy of the Page 1 of the specification i.e. there are two Page 1's in the disclosure.
- The disclosure contains duplicate subject matter on Pages 29 & 30 of the specification i.e. Claims 1 & 2 are disclosed in both Pages 29 & 30.

Appropriate correction is required.

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. A more appropriate title would be "Closed Loop Transmit Diversity using complex basis vector sets for antenna selection".

4. The Specification on Page 5, line 6 discloses "...measuring channel information from signals received through a plurality of antennas used in the base station...". The measuring of the channel information is performed in the "receiving mobile unit" (Specification, Page 6, lines 10-11), which consists of a single antenna (Fig. 3). Therefore, the specification should be changed to "...measuring channel information from signals transmitted through a plurality of antennas used in the base station...".

The Specification on Page 6, lines 11-12 discloses "...measures signals received from a plurality of antennas...". The measuring of the channel information is performed in the "receiving mobile unit" (Specification, Page 6, lines 10-11), which consists of a single antenna (Fig. 3). Therefore, the specification should be changed to "...measures signals transmitted from a plurality of antennas...".

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-6 & 12-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding to Claims 1-6, Claim 1 (independent claim) on lines 5-7 discloses "...measuring channel information from signals received through the plurality of antennas used in the base station...". The measuring of the channel information is performed in the "receiving mobile unit" (Specification, Page 6, lines 10-11), which consists of a single antenna (Fig. 3). Therefore, the measuring of the channel information is performed from signals received through a single antenna.

Regarding to Claims 12-15, Claim 12 (independent claim) on lines 5-7 discloses "...a channel information measuring unit for measuring channel information from signals received through the plurality of antennas...". The measuring of the channel information is performed in the "receiving mobile unit" (Specification, Page 6, lines 10-11), which consists of a single antenna (Fig. 3). Therefore, the measuring of the channel information is performed from signals received through a single antenna.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 1, 5-7, 9, 11, 12 & 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (AAPA) in view of Gerlach et al. (5,634,199) in further view of Hottinen et al. (Transmit Diversity using Filtered Feedback Weights in the FDD / WCDMA System; International Zurich Seminar on Broadband Communications Proceedings; 2000 IEEE; February 2000; Pages 15-21).

Regarding to Claim 1, 5-7, 9, 11, 12 & 15, The Applicant Admitted Prior Art (AAPA) discloses a closed loop transmission antenna diversity method employing a selective combining method when a plurality of antennas are used in a base station of a mobile communication system (Specification,

Page 1, lines 10-22 & Specification, Page 2, lines 6-22 & Specification, Page 3, lines 4-20). The AAPA also discloses that in a closed loop transmit diversity the signal is transmitted from the base station through a plurality of antennas and is received by the receiving mobile unit, which measures the channel information and sends a feed back signal (Specification, Page 2, lines 15-22 & Specification, Page 3, lines 1-3). The AAPA also discloses implementing a selective combining scheme so as to transform the channel information in the receiving unit so as to rapidly and reliably send the feedback signal (Specification, Page 3, lines 9-11 & Specification, Page 8, lines 14-15). However, the AAPA does not disclose calculating the reception power with respect to the plurality of antennas based on the transformed channel information matrix, and transmitting the antenna selection information based on the calculated reception power to the base station as feedback information for controlling the transmission antenna diversity.

Gerlach discloses a wireless communication system comprising a base station and a mobile (receiving) unit implementing transmit diversity using feedback so as to achieve a high desired signal and low cross talk (Abstract, lines 1-8 & Fig. 4 & Column 1, lines 10-37, 64-67 & Column 2, lines 1-20 & Column 5, lines 1-15, 65-67 & Column 6, lines 1-3). Gerlach also discloses measuring and determining the channel information from the received signal at the mobile receiving station (Column 3, lines 1-30 & Column 4, lines 30-50). Gerlach discloses determining the diversity vector from the channel information matrix and implementing selection combining to determine the

weight vector so as to maximize desired signal amplitude at the receiving unit (Column 5, lines 40-67 & Column 6, lines 1-67). Gerlach further discloses the selection or determination of the diversity vector based so as to maximize the measured received power at the receiving station (Column 7, lines 1-10, 65-67 & Column 8, line 1). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gerlach teaches a transmit diversity wireless communication system wherein the antenna selection information is obtained based on the calculated reception power and is feed back to the base station, and this can be implemented in the communication system in the mobile receiving station as described in the AAPA so as to provide a practical, inexpensive and robust method for reducing crosstalk in an adaptive transmit diversity wireless communication system. However, the AAPA in view of Gerlach does not disclose transforming the channel information matrix according to a transform matrix composed of a complex basis vector set.

Hottinen discloses a wireless communication system comprising a transmit diversity scheme adapted for a FDD mode of a third generation WCDMA system (Page 15, Abstract, lines 1-4). Hottinen also discloses implementing the transmit diversity using the closed-loop mode which utilize the downlink measurements and feedback signaling in controlling the phase and / or gain transmit weights of the transmit antenna array (Page 15, Abstract, lines 6-10 & Page 16, left column, "WCDMA Transmit Diversity Concept", lines 15-29). Hottinen also discloses the UE (user equipment)

determines and feeds back transmit weights for the bases station antenna array so as to maximize the SNR at the UE (mobile receiving station) (Page 16, right column, "Feedback Modes", lines 1-5). Hottinen further discloses selecting the complex transmit weights using a basis vector with constant amplitude so as to maintain equal power for the transmission (feedback mode 1) from the each elements in the transmit (base station) antenna array (Page 16, right column, "Feedback Modes", lines 7-40 & Page 17, left column & Page 17, right column). Hottinen also discloses the antenna selection information and phase information indicating the phase difference between the antennas (Page 16, right column, "Feedback Modes", lines 7-40 & Page 17, left column & Page 17, right column). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Hottinen teaches closed loop feedback transmit diversity wherein the complex transmit weights are feed back as a vector, and this can be implemented in the communication system in the receiving station as described in the AAPA in view of Gerlach in further view of Hottinen, so as to provide a balanced power through all the elements of the base station antenna array. Furthermore, the weights computed using the selection combining as described in the AAPA using the power of the received signals so as to maximize the desired signal power at the mobile receiving station as described in Gerlach can be transformed as described in Hottinen and sent as the feedback signal so as to balance the power between the antenna array at the base station.

9. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant Admitted Prior Art (AAPA) in view of Gerlach et al. (5,634,199) in further view of Hottinen et al. (Transmit Diversity using Filtered Feedback Weights in the FDD / WCDMA System; International Zurich Seminar on Broadband Communications Proceedings; 2000 IEEE; February 2000; Pages 15-21) in further view of Gerlach et al. (5,471,647). Regarding to Claim 2, the AAPA in view of Gerlach in further view of Hottinen discloses a transmit diversity communication system comprising measuring channel conditions at the mobile receiving station from a signal transmitted through an antenna array at the base station using complex weighting vectors feed back so as to balance the power between the antennas of the array. However, AAPA in view of Gerlach in further view of Hottinen does not specify using pilot signals for measuring the channel information and setting the pilot signals differently for the plurality of antennas.

Gerlach discloses a transmit diversity wireless communication system using feedback signals so as to optimize the directional properties of the signal transmitted from the base station with respect to the intended mobile receiving station (Abstract, lines 1-3). Gerlach also discloses the base station transmitting probing signals, which are received and monitored by the receiving station, and a feedback signal is sent back to the base station to minimize cross talk (Abstract, lines 5-10). Gerlach further discloses implementing multiple probing signals and information signals for respective

receiving stations can be implemented in the probing mode so as to determine the weights of the antenna array (Column 1, lines 45-65 & Column 3, lines 45-63 & Column 4, lines 39-55 & Fig. 1, element 19(1-m) & Fig. 3a, elements 17(1-m) & Fig. 3b, elements 19(1-m)). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gerlach teaches implementing probing signals (mode) for determining the antenna weights, and this can be implemented in the wireless communications system as described in the AAPA in view of Gerlach in further view of Hottinen so as to prevent cross talk, thus satisfying the limitations of the claim.

***Allowable Subject Matter***

10. Claims 8 & 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Claims 3-4 & 13-14 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 1st paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure, it is recommended to the applicant to amend all the claims so as to be patentable over the cited prior art of record. A

detailed list of pertinent references is included with this Office Action (See Attached "Notice of References Cited" (PTO-892)).

13. Any inquiry concerning this communication or earlier communications

from the examiner should be directed to Sudhanshu C. Pathak whose  
telephone number is (571)-272-3038. The examiner can normally be  
reached on M-F: 9am-6pm.

- If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571)-272-3056
- The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.
- Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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